Hecla Mining Company

June 14, 1990

Holland Shepherd
Reclamation Soils Specialist
Utah Division of Oil, Gas and Mining
355 North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

RE: Hecla Escalante Unit Tailing Impoundment Reclamation

Dear Mr. Shepherd:

We have received and reviewed your letter of March 26, 1990, that addresses the Division's concerns to the reclamation approach Hecla presented to the staff in February. It is our hope to put many of your concerns to rest with the revised proposal outlined in this letter.

Hecla agrees that one of the more important reclamation objectives is to isolate the tailings as much as possible from the environment. We also share your intention to work with you in agreeing to the most economically feasible solution to reclaim and isolate the tailing material.

During the last meeting and in previous correspondence, we believe that both the agencies and Hecla came to the conclusion that the tailing wash would not be advantageous for a number of reasons. Because of this determination, we are not spending any effort to develop a "tailings wash" plan.

Another item of discussion at the meeting revolved around the residual moisture in the tailing impoundment. Brent Willoughby and I agreed not to plug the underdrains for a two-year period. Until this time, any flow that may be discharged out of the underdrains would be captured and evaporated in our storage tanks. It is our desire to cap the underdrains two years after surface reclamation when we can be assured that leachate flow is not a problem. Our final reclamation proposal will be amended to state this situation in more detail.

The following discussion states our current proposal to isolate the tailing material. This approach will be incorporated in our final comprehensive reclamation proposal if the Division is comfortable with our findings. At that time, we will present the detailed design maps as you have requested.

6500 Mineral Drive • Box C-8000 • Coeur d'Alene, Idaho 83814-1931 • (208) 769-4100 • TELEX 326476

TAILING CAP/CAPILLARY BARRIER PROPOSAL

General Approach

Hecla recognizes the Division's desire to minimize potential leaching from excess moisture, and to minimize potential vegetative toxicity from any contaminant uptake. Many discussions have taken place concerning the amount and type of material to cover the tailing impoundment. While we generally agree on the Division's rationale for a capillary barrier and rooting medium, we are not comfortable with the depth of materials to be used.

In order to realistically determine the amount of soil materials needed to isolate the tailings, we have taken an on-the-ground field approach. The Cedar City Bureau of Land Management (BLM) and Soil Conservation Service (SCS) have given us considerable insight and information regarding this problem solving approach.

Existing Information

In researching the SCS soils information in the Escalante mine area, we find that the soils are classified as "Checkett". The Checkett soil unit is characterized chiefly as a 60% gravely loam. Besides other minor soil components, the Checkett unit also includes a 10% moderately deep clay loam. The Checkett surface layer is a pale brown loam, three inches thick. The upper three inches of the subsoil is a yellowish-brown gravely clay loam. The lower part is a strong brown, very cobbly clay loam, five inches thick. Depth to fractured bedrock ranges from fourteen to twenty inches.

Permeability of the Checkett is moderately slow. Available water capacity is very low. Water supplying (holding) capacity is four to five inches. Effective rooting depth is fourteen inches. The rooting depth can be greater than twenty inches when fractured bedrock is encountered.

The SCS information also states that the suitability of this unit for rangeland seeding is poor. The main limitations for seeding are the shallow depth (in places) to bedrock and low water holding capacity.

This area of southwestern Utah has two precipitation gauges near the Escalante mine. To the south, the town of Enterprise receives, on the average, 12.2 inches of precipitation per year. To the north, the town of Beryl receives 8.0 inches of annual precipitation. It is estimated that the Escalante mine receives approximately 10 to 11 inches annually.

The precipitation gauges indicated that 40% to 50% of all moisture occurs during July in the form of summer storms. The January through March period also receives precipitation in greater amounts than other times of the year.

Field Investigations

We know that among other factors, rooting depth is determined by the moisture holding capacity of the soil, precipitation, and timing of precipitation. However, the BLM suggests the best way to determine rooting depth in a soil to be used in a tailing cap is to excavate a soils pit to observe rooting depth. So, we excavated a few pits in the Checkett soil that would most likely be used to cap the tailing material. As can be seen by the enclosed photos, the rooting depth appears around the fourteen-inch depth. BLM representatives have suggested that maximum root penetration should correlate with maximum water infiltration. Another function of deep rooting that is not necessarily moisture-dependent would be for shoot stabilization. In the photo, the roots hanging to a lower depth are actually lateral roots occurring above the fourteen-inch layer that were not severed at the soil face during excavation. The larger and deeper roots are sagebrush roots. The finer grass and forb roots appear near the first eight inches. This information agrees with the SCS analysis and further documents site-specific rooting depth in the tailings impoundment area.

Plan of Action

In creating a capillary barrier to impede the downward migration of moisture, and to minimize any upward translocation of potentially available salts or metals, we must also consider the local resources available, past UDOGM approved topsoil storage plans, the reclamation bond amount, and new reclamation information gathered in the last ten years. We believe the following new capping plan is technically achievable and ecologically safe. Although these requirements exceed our initial reclamation bond and commitments, this updated information justifies additional expenditure to assure future bond release.

Generally, our plan consists of an eight inch capillary clay barrier. The clay barrier would be compacted as placed on top of the tailings. A six inch layer of clayey subsoil would be placed on top of the clay barrier. The four inches of stored topsoil would be placed on top of the clayey subsoil and revegetated. The total amount of material placed on top of the tailings impoundment would be eighteen inches.

8"
6"
4"
18"-T
10" rooting

More specifically, the compacted clay capillary barrier would come from the Checkett clay deposits located near the tailing topsoil stockpile. This clay source is the same deposit that was used to line the tailings impoundment. Past site experience with the Checkett clay soils has shown to work well for alleviating downward fluid movement when compacted with normal earthworking traffic. The Checkett clay should also work equally well in alleviating upward capillary action.

To further assist in the prevention of upward mobilization of contaminants, we intend to cover the tailing material when that surface is dewatered and dried to a depth of at least one foot. During the hot, dry season, we have observed drying to two to three foot depths in non-discharging portions of the containment. This action will essentially increase the capillary barrier to at least twenty inches. It will also help prevent moisture contaminate uptake by any unexpected stray shrub roots. As stated in previous correspondence, Fox

- with vol vat

consultants have stated that their drilling confirmed the tailing vertical permeability of 1.85 x 10^{-5} cm/sec. (mean value, highly variable) 10^{-2} to 10^{-6}

The six-inch subsoil layer should duplicate the soil layer in adjacent areas. This clayey layer would provide a rooting medium as well as a medium for supplying vegetation with moisture. The four inches of topsoil consists of the material stockpiled in the past. This layer will provide water holding capacity during the dormant season and a fertile root medium. The water supplying capacity of the Checkett soils is only four to five inches. This shows the Checkett soils would have a higher runoff coefficient during storm events or a fast snowmelt. This is advantageous in minimizing the amount of moisture that may reach the lower reaches of the plant root zone. The naturally gravely surface condition of the Checkett topsoil should provide adequate erosional armorment for any surface flow.

As shown by the soil information researched and gathered, the root penetration level was approximately fourteen inches. Root penetration was deeper when bedrock is present. In the capping situation, bedrock, of course, won't be present. The eight-inch compacted clay layer should act to prevent downward migration of moisture, thus downward migration of roots. In the test pits, the roots that extended to this depth were the sagebrush roots. Since little moisture is present at depth, it is speculated that the roots found at the lower level function more as structural support of the plant rather than for moisture uptake.

In order to further remove the potential of downward water migration and contaminant uptake from the tailings area, we propose to seed the area with shallow-rooted grasses. The shallow-rooted grasses will be able to uptake moisture earlier in the year when the shrubs are still dormant. This should help minimize the amount of water that migrates to the top of the compacted clay layer. The grasses will also uptake water from storm events more efficiently.

Because of limiting resources (topsoil), on this site, we must accept that ultimately a physical and/or chemical climax community of grasses may dominate. Any pioneering deep-rooted shrub or forb species that takes root, may temporarily establish in a less vigorous, edaphic controlled state.

Expectations and Management

We expect the shallow-rooted grasses to establish and hopefully dominate. Because of the difficulty of rangeland seeding in Checkett soils, follow-up grass seedings may be needed. A diversity of grasses should establish roots down to the top of the compacted clay layer. These species will more quickly uptake excess moisture than the shrub and forb species.

In the long term management of this area, it would be best to treat these soils as if the soils were sodic. Sodic or natric soil horizons exist in southwestern Utah. These soils are managed to minimize the uptake of salts. The two mechanisms that we intend to use on the tailing reclamation to minimize the uptake of salts are the barrier and control mechanisms. The barrier mechanism will be the compacted clay liner. Initial species management will stabilize the

soil to maintain this barrier. The control mechanism would assure long term federal land management for the appropriate uses and to assure the site is never irrigated. Continual irrigation may enable excess salts or metals to translocate upwards to the root zone as has been demonstrated on irrigated natric soils. These same management strategies should also maintain the desired high pH values of the isolated tailings.

In the very worst, unforseen situation, this area in the distant future, could become a natric soil. However, for this to occur, excess moisture would have to infiltrate through the compacted clay, then saturate the dry foot-thick layer of tailings. In addition, roots would then need to fully penetrate the compacted clay, so that both translocation and transpiration would happen. Furthermore, the precipitation would need to be vastly increased over a period of years for roots to establish. If shrub and forb roots reached this depth, they would need to survive its potential toxicity. If all these situations occurred, a natric soil, similar to many southwestern Utah soils may develop.

Areas with natric soils are used for rangeland and wildlife habitat. If the situation above occurs in the future, the potential plant community that would succeed the revegetated community would most likely consist of 25% grasses, 10% forb and 65% shrubs. In this situation, there would be successional edaphic trend towards important species such as bottle-brush squirreltail, black greasewood and shadscale.

We have scheduled, as stated in our earlier draft proposal, that milling should be complete by August, 1990, and that earthwork could start as early as September of 1990, especially in the dried out areas of the impoundment that will receive no summertime use. Our plans are to fast-track the remaining reclamation design work and approvals. We hope you take our tight time line into consideration in reviewing our proposal.

If you would like to discuss this further, I can be reached at the number on the letterhead, or Brent Willoughby can be reached at (208) 769-4145.

Sincerely yours,

P. Bryan Johnson

P. Bryan Johnson
Environmental Specialist

PBJ:dld

Attachments

cc: B. Willoughby
Paul Carter - BLM
Tom Simper - SCS
G. Jaramillo